Prospective applicants to the DISE Program should be aware of the following considerations:

I. Prospects for Success in DISE

It is anticipated that sufficient funds will be available in Fiscal Year 1979 to support the initiation of some 40 to 50 new projects. Past experience suggests that the number of preliminary inquiries may be ten or more times greater. Accordingly, the DISE Program conducts a two-phase competition. Preliminary proposals requiring only modest effort on the part of the proposer are screened to reduce initial requests to a much smaller number of finalists. This latter group then is encouraged to make the substantially greater investment of effort required to be considered in the final competition for funds. (See also page 9.)

II. The Foundation supports several related and complementary programs and program elements which, despite similarities, are non-duplicative.

A. Research in Science Education (RISE). An unbroken spectrum of activities exists between those that are primarily "development" and those that are primarily "research." Proposers who are interested in projects that are more research than development should request the relevant guidelines, SE 79-55, with a view toward applying to RISE for support. (As might be expected, the findings of RISE projects sometimes become the foundation of subsequent DISE Projects, and vice versa.)

B. Research on Cognitive Processes and the Structure of Knowledge in Science and Mathematics. The closing date for this joint NIE-NSF program was June 22, 1978, but another program cycle in fiscal year 1979 is expected. Proposers interested in this focused area of investigation into fundamental learning phenomena should request the relevant guidelines, SE 79-53.

C. Local Course Improvement for Undergraduate Science Education (LOCI). This program supports college-level course improvement efforts conceived and designed for a specific local application rather than for eventual use in many settings. Projects may involve adaptations of existing models or wholly novel approaches. They are distinguished from DISE projects by the absence of formal attention to a broad background of need, or to means for achieving broad dissemination of the project results. (LOCI projects sometimes may provide the basis for a later DISE project on a wider geographical scale.) Request SE 79-34.

(Continued inside back cover)

DEVELOPMENT IN SCIENCE EDUCATION

OBJECTIVES

The long-term goal of the Development in Science Education (DISE) Program is to increase the quality and diversity of science education in the United States. It provides funding needed to originate, develop and experiment with new ideas having potential for improving science education--education aimed at any level and designed for any group of people. The objectives in any particular year may be more limited so as to focus resources on specific types of activity, populations or disciplinary areas selected for their national importance or timeliness. Five such areas will be emphasized during the effective life of this Guide (August 1978 through March 1980):

A. Science for the Early Adolescent

B. Improving Access to Careers in Science

C. Science, Technology and Society

D. New Knowledge and New Skills--Education for Productivity

E. Technology as Applied to Learning

Proposals directed at concerns other than these five may be submitted, but they will need to be of substantially greater-than-ordinary interest or potential national value if they are to gain serious consideration.

SCOPE

Projects that deal with the physical, biological, or social sciences, engineering, mathematics, technology, or combinations of these disciplines will be entertained. However, the practice aspects of technical, clinical, health, social and business fields are excluded. (Examples of areas that will not be considered by the DISE Program are medicine, nursing, clinical psychology, social work, business administration, the arts, and the humanities.)

Activities supported by DISE[1] include:

- Development, testing and evaluation of new instructional materials.
- Design, testing and evaluation of innovative instructional delivery modes both in formal school settings, and in out-of-school situations.

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[1] See also the inside front cover.

- Identification of technologies that promise enhanced effectiveness of science education; experimentation with and improvement of these technologies.

Assistance will be aimed at developing new methods (having tested utility and reasonable cost) for adapting science education to current circumstances. Where the context permits, DISE projects should be designed to produce both a useful new instructional resource and also such advances in our knowledge of the teaching/learning situation as can be achieved without diffusing the project's principal focus. Specific provisions should be designed into each project to promote dissemination of project results to prospective users. Thus, the activities must show promise of providing new, practical and economical outcomes that would be useful beyond the immediate confines of the development activity--i.e., they must not be site-specific. Local implementation or adaptation of already-developed models cannot be funded under this Program. (See comments on LOCI inside the front cover.)

The activities must not be more appropriately the concern of other public agencies or of the private sector. Each project must exhibit a clear and strong association with science education in conformity to NSF's operational definition of science cited above. Clinical sciences and the humanities are supported through the Department of Health, Education and Welfare, and through the National Endowment for the Humanities. NSF support is available only for development projects that are, for valid and adducible reasons, not likely to attract support from business or private foundations.

It is generally true that formal proposals will be strengthened by a systematic consideration of the theoretical foundations and the relevant literature upon which the project is based. Purely intuitional approaches will be downgraded if reviewers find that relevant findings of other workers or concurrent efforts with which an investigator should be familiar have been neglected.

No single award will cover a time period of more than three years, although projects of longer duration are possible if sequential awards are shown to be justified. Proposers with new ideas are encouraged to start with a small, exploratory plan and then, if the results are encouraging, to come back later for support of more extensive development efforts.[2]

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[2] We recognize that there may be situations where this is not practical, but generally DISE expects to make a fair number of smaller phased grants rather than a few larger ones.

Where support for only the early phase(s) of an extended project is being requested, the narrative should

(a) briefly outline the scope of the entire project and estimate its ultimate costs in terms of manpower and finances;

(b) concentrate upon the activities for which support is initially requested; and

(c) show how, even if no support beyond the initial phase were to be awarded, demonstrable gains would be made. Initial phases should be limited in scope, but should be designed to reach a significant benchmark.

OTHER IMPORTANT FACTORS

Proposals are to demonstrate that need has been clearly and objectively established, and that there are good reasons for believing that others (preferably many others) are likely to benefit from the project's outcome.

Projects intended to introduce economies to the educational system will start with a competitive advantage. Cost-effectiveness--the same quality at less cost or greater quality at equal cost--is a crucial concern. If a project's results promise to be substantially more expensive than whatever they replace, the project is less likely to be supported than would be true otherwise.

Dissemination of development project findings and products should not be left merely to chance. The end products should lend themselves to documentation or to an evaluation that could provide non-partisan information about the results. Project budgets may include support for bringing the project's results to the attention of others who face similar problems or opportunities.

The project must include elements that are experimental, innovative, unusual or significantly different from what has been done elsewhere. New knowledge should be generated. A premium will be placed upon what peers regard as "good ideas."

In addition, proposals will be judged on such factors as

- qualifications of personnel;
- quality of institutional commitment and resources;
- appropriateness of project design;
- suitability of the evaluation plan; and
- reasonableness of the budget.

ELIGIBLE INSTITUTIONS

Proposals may be submitted by nonprofit organizations engaged in science education activities, such as colleges and universities; professional, scientific and educational associations or societies; research institutes and laboratories; and state educational agencies. Individual schools, school districts, regional subdivisions of a state, for-profit organizations, and their personnel are not eligible for direct grants under this Program, but may participate in DISE projects by collaborating with an eligible organization.

PROGRAM AREAS

A. Science for the Early Adolescent: The period of early adolescence (approximately the age span that junior high and middle schools address) is critical to the science education of students. This is often the last opportunity to reach these students, as many have been choosing not to take science courses in senior high school. Thus, it is essential that science instruction be of highest quality during this period, both for the sake of raising the level of scientific awareness in the general population, and for retaining in science those who may later have an interest in scientific professions or other science-related careers.

Despite the widely acknowledged importance of the period of early adolescence, it has received little emphasis in science education. Teacher education programs tend to be aimed at the elementary or secondary levels, with neither specifically addressing the junior high or middle school. The science curriculum too often fails to appear relevant to the daily life of the early adolescent, neither exciting their curiosity, nor addressing their career planning concerns.

Since the scope of the problem is far greater than what the Foundation can attack directly, the development of models is sought. Such models should have the potential for adoption on a broad scale, and should be one of the following types:

1. Pre-service teacher education programs specifically designed to prepare junior high or middle school teachers. Such programs should be centered on the nature of the early adolescent learner and may encourage interdisciplinary instruction.

2. In-service science education programs for junior high and middle school teachers and, where good justification exists, for such other staff as administrators, counselors and aides. These models should represent cooperative school-university relationships where control is established to guarantee that specific, local problems will be addressed. Projects that transcend traditional disciplinary boundaries in the sciences are fully acceptable.

3. Techniques and prototype materials designed to increase the career relevance of science education for early adolescents. These should be supplementary techniques and materials of potential use with a number of basic curricula. Focus should be on science and science-related careers, and should not stress only those careers which require advanced degrees. Special consideration will be given to those models which emphasize experiences particularly relevant for minorities and/or young women. (See also Sections A4 and B, below.)

4. Projects to provide opportunities for early adolescents to have first hand experiences with scientific phenomena and settings. Emphasis should be on reinforcing regular instruction in a systematic and coordinated manner.

As the emphasis is on the development of generalizable models, each project should establish procedures for generating information about the model: What problems are likely to be met in attempting to install it in other locations? What will be the costs associated with its adoption or adaptation? Where the project does not wish to conduct this knowledge generation with internal evaluators, external experts may be employed as consultants or even sub-contractors.

One key purpose of any project in this program area should be to provide additional options in science for early adolescents; options that will both educate and excite. Adjunctive educational approaches for informal out-of-school settings may be especially effective with this age group.

B. Improving Access to Careers in Science: The professional cadre of scientists and engineers in this country continues, despite efforts at amelioration, to reflect inadequate participation of women and some of the minorities. These imbalances run counter to the distribution of talent, and thus represent a waste of scientific potential.

The DISE Program will give careful consideration to projects that propose to develop and test materials, teaching approaches, structures or activities designed to overcome barriers to science careers and to retain in science course sequences a far greater proportion of these groups.

C. Science, Technology, and Society: Science and technology, their impact and their consequences, can be understood and evaluated only in the context of the larger society in which they exist and together with the other great intellectual and aesthetic activities of modern life. However, the connections between science and society are rarely the substance of education at any level--

> For the most part, the education of scientists and engineers fails to deal in any depth with the humanistic aspects of their work or to raise the difficult issue of the social responsibilities of science;
>
> Education in the non-scientific professions is equally deficient in its neglect of science, and the general education of most citizens prepares them poorly to deal with the science-related social issues and value problems of the day.

The DISE program is interested in helping to develop and test learning materials and teaching approaches that address these problems. Proposals can address any aspect of the relationship of science, technology and human values--at any educational level. Where appropriate, the collaboration of colleges and pre-collegiate institutions, or of academic and industrial organizations, is encouraged. The following examples may suggest the kinds of projects which might be supported under this heading.

- The science education of persons preparing for careers in the non-science professions, such as law, business, public administration, and teaching.

- The integration of issues of ethics, values, and social responsibility into the professional education of scientists and engineers. (See also comments on EVIST, inside the back cover.)

- The development of innovative curricula and materials at precollegiate levels that deal with the social role and consequences of science and technology. Plans will be considered for incorporating such instruction into formal education in social studies, history and other non-science courses, as well as those concentrating on the improvement of science courses along these lines.

- The encouragement at all educational levels of innovative courses and materials dealing with the interrelationships of science, the arts, and the humanities, to bring about the mutual enrichment of the great domains of learning.

- The enrichment of the science experience of children and adults through extra-curricular programs, such as science clubs and museum activities that are designed to supplement formal science education. (See also notes on PUOS, inside the back cover.)

D. New Knowledge and New Skills--Education for Productivity: National productivity and economic progress depend on a society's ability to capitalize upon new technological opportunities. New scientific advances and new technologies such as microelectronics make older systems obsolete. The country that can develop trained people who have acquired the new basic knowledge and can apply the new techniques will be able to sustain the quality of life, both through economic strength and the design of new economic configurations such as are implied by the appropriate technology movement.

To help society respond to changing conditions, the educational system must be able to rapidly and widely disseminate the results of scientific research and invention. It is desirable to reduce the time lag between the discovery of new principles and practices and their appearance in relevant curricula and instructional materials. This applies both to the training of new applied scientists and engineers and to the continuing education of practicing professionals. Educational programs need to identify and provide new mixes of skills, career orientations, and presentation modes.

The DISE Program is open to proposals for improving the ability of our educational system to meet these needs through the infusion of the latest and most forward-looking science and technology into core courses. Such efforts are most likely to be needed at the upper division, graduate and continuing education levels. They may address either the needs of those who will teach scientists and engineers, or those who will apply their improved knowledge directly. Academic-industrial or user collaboration is encouraged.

Project scope and potential impact should address the general problems faced in trying to make the educational system responsive to new knowledge and techniques in the area of concern. Content should reflect the latest scientific knowledge and be illustrated by new processes that make major differences. Since technology transfer depends upon people who will continually seek out and apply new principles and practices as they emerge, proposed projects should promote a lifelong problem-solving orientation.

Proposers should be aware that only a small number of pilot efforts of particular inventiveness in dealing with the problems of injecting new knowledge into the educational system are likely to be supported. Key areas of concern include education for applying science and appropriate technology to energy, environment, and economic productivity.

E. Technology as Applied to Learning: Recent technological achievements offer increased opportunities for improved learning at all levels. The power and diversity of computers and other electronic technology have already been demonstrated widely, but the implications of their ever decreasing cost and of such recent introductions as microprocessors continue to invite educational exploitation. Such devices as quick copiers, lasers, holography, satellite communications and other data transmission systems also hold promise for use in education.

Therefore, the DISE Program will consider the support of experimental projects designed to employ novel applications of technology to improve science education at any level. As with the other DISE topics discussed above, specific attention should be given to such considerations as improving cost-benefits, creating and testing new instructional materials or techniques, achieving greater subject matter mastery per unit of student/teacher effort, fostering constructive student responses and attitudes, advancing other generally recognized educational goals--and making the project's outcomes widely available. Results that are applicable across academic departmental (disciplinary) lines will be especially welcome.

SUBMISSION OF PROPOSALS

In the DISE program, preliminary proposals are required that sketch in broad strokes the essential features of the project--its purpose, the design procedures, the evaluation plan (if appropriate), the key personnel and their duties, and estimates of costs and project duration. Each preliminary proposal should consist of the following elements:

1. A cover page in the format shown on page 10.

2. A narrative of no more than eight double-spaced typewritten pages providing a rationale for the activity, a description of the resources, a procedural plan, and a description of the anticipated results or product.

3. An estimated budget in the format shown on page 11.

No signatures of institutional representatives are required at this stage by the Foundation. The preliminary proposal will be reviewed by Foundation staff and, where necessary, by outside judges. Reviewers will evaluate the proposed project's responsiveness to these Guidelines and its merit as measured against the "Other Important Factors" discussed on page 3.

Eight copies of the preliminary proposal and two spare copies of the cover sheet, securely wrapped into a single package, should be sent to:

Development in Science Education
SEDR/W-630
National Science Foundation
Washington, D. C. 20550

N.B. Preliminary proposals should not be sent to NSF's Central Processing Section.

SCHEDULE

Preliminary proposals as described above may be submitted at any time following the distribution of these Guidelines. Those received on or before November 30, 1978 are guaranteed processing according to the following schedule:

NSF's reply, encouraging or discouraging preparation of a formal proposal, will be sent in February, 1979;

Formal proposals will be due in April; and

NSF will announce funding decisions in August, 1979.

We are hopeful that a substantial proportion of the preliminary proposals will be received well before November 30. Those submitted too late for processing in this program cycle will be entered into the following cycle (for decision approximately nine months later, in Fiscal Year 1980) if this appears feasible in terms of the project's internal schedule; otherwise they will be returned for the proposer to decide what next steps should be taken.

No formal proposal will be considered in DISE until it has been considered in a preliminary form as described above. The Foundation will reply to all preliminaries, either encouraging or discouraging a formal submission. Proposers who are not encouraged to submit a formal proposal may still do so if, in their judgment, their peers are more likely to be receptive to their formal proposal than the preliminary reaction indicated. Proposers are urged to give due consideration to the funding prospects noted inside the front cover of this brochure when making this decision. Information regarding the format for formal proposals will be included in all responses to preliminary proposals.

Telephone inquiries may be made to the staff at 202/282-7904, but these should be limited to matters not adequately covered in this Guide.

(FORMAT for Cover Sheet)

PRELIMINARY PROPOSAL

INSTITUTION: ____________________

PROJECT DIRECTOR'S NAME: ____________________ SSN:* ____________

OFFICE ADDRESS: ____________________

OFFICE PHONE: (   ) ____________ HOME PHONE (   ) ____________

TITLE OF PROJECT (10 word limit): ____________________

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DISCIPLINES INVOLVED: ____________________

	A. Phase for which support is currently requested	B. Likely future phase(s)	C. Total (A&B)
Estimated Cost:	$____________	$____________	$____________
Estimated Duration:	____________ months	____________ months	____________ months

Desired date for initiation of project activity: ____________________

Submitted in response to:

____ Science for the Early Adolescent

____ Improving Access to Careers in Science

____ Science, Technology and Society

____ New Knowledge and New Skills--Education for Productivity

____ Technology as Applied to Learning

____ Other

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* Submission of social security numbers is voluntary and will not affect the organization's eligibility for an award. However, they are an integral part of the NSF information system and assist in processing the proposal.

(FORMAT for Preliminary Proposals, DISE)

SUMMARY OF BUDGET ESTIMATES

	INITIAL PHASE (Current Request)	Total of all (present and projected future) phases
Salaries, wages & fringe benefits............	$	$
Equipment....................................		
Materials & Supplies.........................		
Travel.......................................		
Publication costs............................		
Computer services............................		
Consultant services..........................		
Other direct costs (itemize by category)		
Indirect costs		
Current institutional rate is ____%		
of ____________		
TOTAL, direct & indirect costs..............	$	$